

End-to-End Development of a High-Altitude Pressure Vessel

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Project Overview

Active Luminescence For x-Ray Emission Detection (ALFRED) is a NASA USIP with the goal of building and testing an active radiation shield in support of x-ray observation platforms like HEROES. The proof of concept flight reached 48 km on a zero pressure balloon at the Columbia Scientific Ballooning Facility (CSBF) in Fort Sumner, NM.

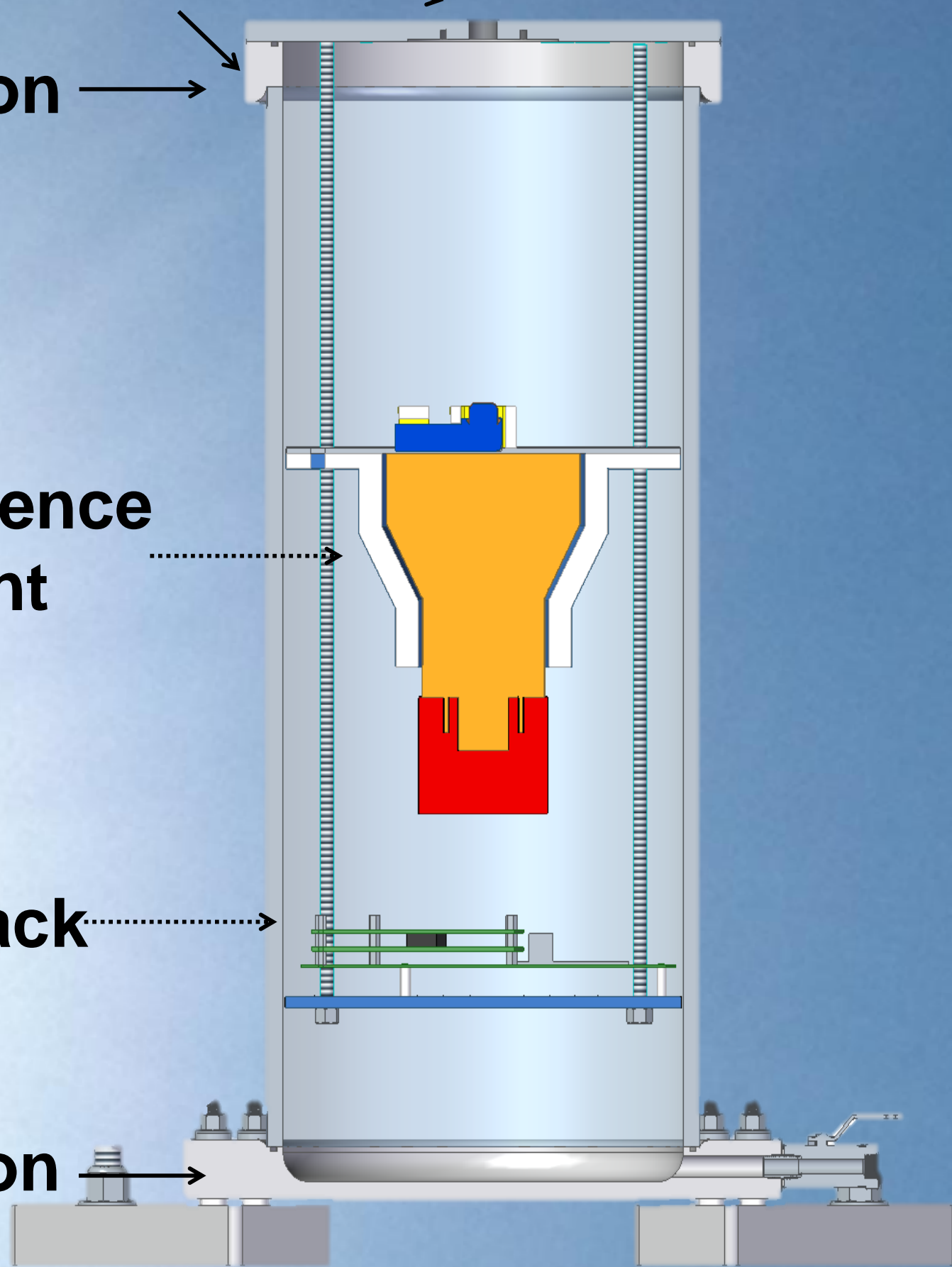
O-Ring Locations

Weld Location

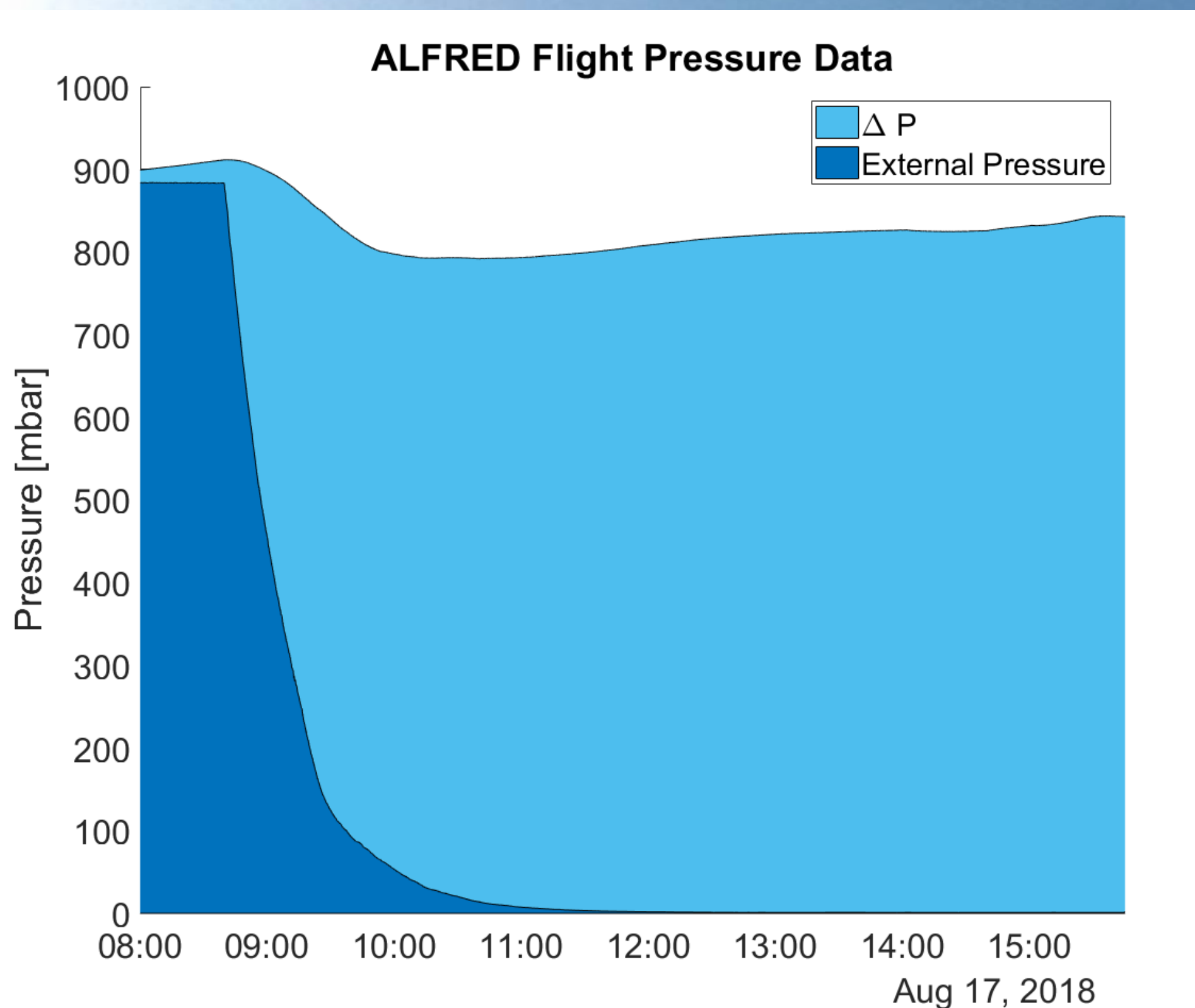
Anti-Coincidence Instrument

Circuit Stack

Weld Location



CAD of the Modular Internal Structure



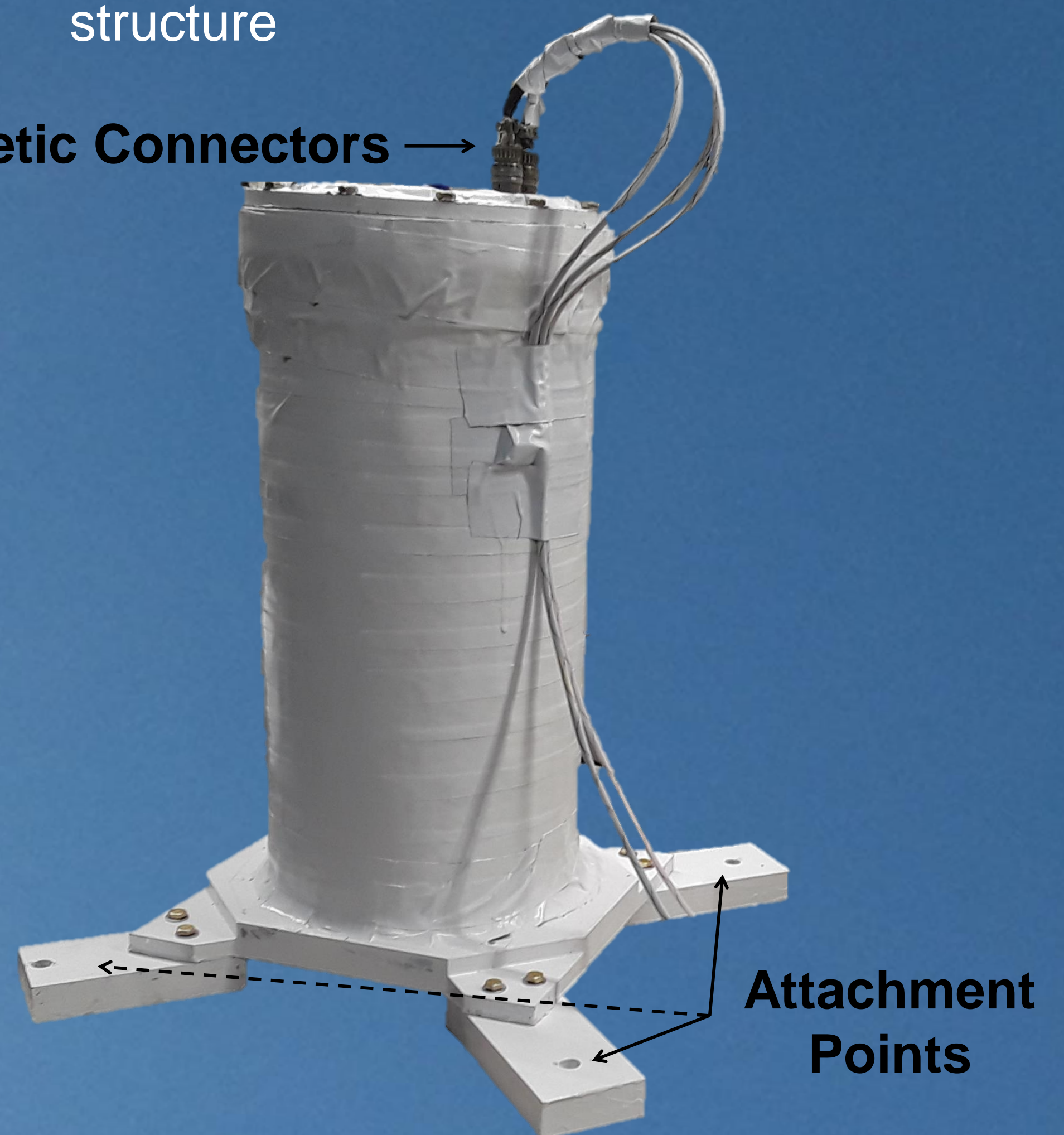
- Exterior and internal pressure data collected during flight
- Pressure vessel successfully maintained pressure

Design Overview

Major sensors in the system needed a temperature-controlled, dry, pressurized environment to function nominally and not experience arcing at high altitudes.

- Casing designed as a pressure vessel with N₂ purge and internal heaters
- Power and data cables passed through hermetic connectors
- Equipment secured on case-long rail structure

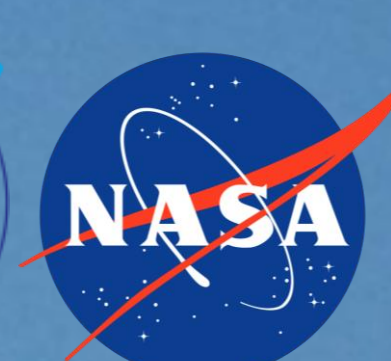
Hermetic Connectors



Assembled Instrument

Impact

ALFRED successfully demonstrated a low-cost hybrid of passive and active shielding systems for high energy telescopes, providing a valuable flight demonstration of CLYC as a scintillation material. Its robust housing guaranteed successful operation of the instrument, protecting the equipment from near-vacuum conditions at the top of the stratosphere while holding the instrument and circuit stack together in a modular, easily-assembled package.



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